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Some Impressions regarding the Control of Animal Disease gained during a Three Months' Tour in Germany.

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It must ever be instructive to visit another land, to learn of its customs and its lore, and gain insight into the character and sympathies of its peoples. The peoples of Germany are diverse, but united in a common wish to make the Fatherland great amongst nations; alike, too, in thoroughness and tenacity.

In their painstaking efforts to mitigate the vast toll of animal disease, no less than in other ways, these characteristics are displayed. They have contagious disease, in no less measure than ourselves, but in their control they have not the inestimable advantage of a protecting circle of water. Yet by detailed regulations, enforced by a rigid police and helped by that inborn respect of authority which stamps its people, foot-and-mouth disease, glanders, rabies and like dangers, whose prevalence in neighbouring territories may at any time threaten their borders, are prevented from becoming a menace.

Diseases, too, of an insidious but less explosive nature, are attacked in a manner only possible through the initiative and co-operation of its farmers and veterinarians, and the realisation by its government of the value to the nation of agriculture and an efficient health service.

In many ways, their schemes are yet incomplete, but they exist and grow year by year as interest and funds permit.

Imperial regulations have long existed for the control of foodstuffs and to prevent transmission of contagious disease. Other regulations of a more general kind are made by the central government, authorising the production of special qualities of milk and official assistance in the control of animal disease on the farm. The actual operation of the orders is in the hands of the provincial government, who possess an advisory body in the *Landwirtschaftskammer* (provincial chamber of agriculture); to them is entrusted the formulation of the details necessary for the production of milks of special designations and the elaboration of the schemes to assist farmers who may be suffering severe loss from widespread diseases such as tuberculosis and mastitis.

The necessary laboratory work is carried out by an institute specially created for the purpose and which may devote its time to pathological work only or have in addition chemical and other departments. In some provinces a special institute exists for the control of tuberculosis. The heads and the majority of the professional staff are veterinarians. Each institute also employs about an equal number of so-called "technical assistants"; these are generally women and have received two years' training solely in laboratory technique. They appear quickly to become expert in the particular department in which they are employed.

For the purpose of the administration of the acts and orders a province is divided into districts, each of which is controlled, through the police authorities, by an official whole-time veterinarian. He is responsible to the Director of the Institute of the *Landwirtschaftskammer*, who is the co-ordinating officer for the whole province.

The method for collecting the money required for indemnification for animals compulsorily slaughtered is interesting. The central government contributes one-fifth, the remainder being raised by a provincial levy on every stockowner according to the number of his animals, of which he must make a return every December. The amount payable per head of cattle or horses is based on the total indemnification necessitated by disease in that province during the previous year. So has each owner a definite interest in keeping disease incidence low and is penalised if his neighbours do not likewise.

Milk Supplies and their Control.

In Germany there are nearly 10 million cows which produce yearly approximately 5,000 million gallons of milk of value about 300 million pounds sterling. About 60 per cent. is used for the manufacture of butter, cheese and other milk products or for animal feeding, whilst the remainder, about 2,000 million gallons, is sold for direct consumption. This equals about two-thirds of a pint per head of the population and is greater than that of England, though distinctly below that of the U.S.A.

The control of ordinary milk is, as in this country, in the hands of the police, and is effected in a similar manner by taking at least three samples a year from every dealer and by "spot" sampling. The sale of milk containing mastitis streptococci has, however, been forbidden since July, 1927. Fat must not be less than 2·7 per cent.

A bill for the further control of milk supplies in Germany is now in course of preparation; but although at present no detailed imperial regulations exist for the production of specially designated milks, these are produced in most provinces under conditions laid down by the *Landwirtschaftskammer* and must, by law, conform. Examples of such are "*Vorzugsmilch*," probably best translated as "preference milk," "*Kindermilch*" for children and "*Krankheitsmilch*" for the sick. The actual grades vary according to the province, but all must be obtained under clean conditions, from herds kept solely for the purpose, housed and fed suitably, and subjected to periodical clinical and bacteriological examination for tuberculosis, mastitis, and other diseases or conditions considered likely to render the milk unfit for human consumption. Each cow must give milk containing at least 3 per cent. butter fat. In most cases a bacterial content of 50,000 organisms per c.c. is the maximum allowed. Such milk must be

bottled, whereas in most if not all provinces the bottling of ordinary, so-called " *Vollmilch*," is not allowed.

Pasteurised milk must be bottled and labelled suitably. The milk heated must not be more than 24 hours old. The heating may be carried out by holding at 63-65° C. for half an hour or by raising the temperature to 85° C., provided always that the apparatus is passed as satisfactory and that in any single case the heating can be shown to meet the required standards.

The price of specially designated milks varies according to the province and actual grade, but milk of a definitely superior character commands a price 35-50 per cent. higher than that of ordinary " *Vollmilch*." As an example, in one town of about 50,000 inhabitants, ordinary milk costs the equivalent of 1s. 2d. per gallon, pasteurised milk 1s. 5d., and " *Vorzugsmilch* " 1s. 9d.

Mastitis.

German writers have estimated that their annual loss from mastitis approaches the sum of 200 million marks (10 million pounds sterling).

In Germany, as elsewhere, streptococci are by far the most common cause of mastitis and probably account for not less than 85 per cent. of cases. It is estimated that between 10 and 20 per cent. of all cows are affected, the percentage being lower, 1-5 per cent., in the smaller self-contained herds, than in the large " *Abmelkschafte*," establishments where cows are constantly bought and milked through the current lactation period only; in these the percentage may be sixty or more. The figures are to a large extent based on the results of examination other than cultural. So serious has the disease become in many provinces that an effort is being made to alleviate it, usually by the Institute of the *Landwirtschaftskammer* (Chamber of Agriculture).

The problem has been attacked in two ways: by attempts to produce immunity and by selection and segregation.

Immunity. Attempts have been made to render healthy animals resistant to infection and its consequences. Autogenous heat-killed cultures have generally been used subcutaneously and good results have been reported by some workers, but the results of experiments in which sufficient controls were used are not encouraging. Good results are reported following the subcutaneous injection of living culture and following the injection of formalised vaccine subcutaneously at the back of the udder, but these need confirmation. Curative vaccination has not met with success.

Selection and Segregation. The actual methods vary considerably in the different provinces, but are based on the hypothesis that animals once infected remain chronic cases or carriers and that the disease, spread from these, may infect another animal, probably *via* the teat canal. The consensus of opinion is distinctly in favour of this view, although little actual work has been done on the method of infection. Experiments recently carried out at the Berlin Veterinary School support earlier work in pointing to the teat canal as the only likely natural portal of infection. The experiments and views of Stenstrom are, however, accepted by some workers who consider oral infection more than possible.

The regulation which exists forbidding the sale of milk containing mastitis streptococci, although not rigorously enforced, does assist in any scheme for eradicating mastitis, because once a cow is found to be harbouring streptococci, the affected milk must immediately be excluded from sale for human consumption in the raw state.

Control is effected in one of two ways; directly by voluntary schemes specially arranged to help the owner, who, suffering a severe yearly loss from mastitis, can submit his whole herd to examination on payment of a nominal charge: indirectly through the schemes under which there exist milks with special designations.

Under most schemes a clinical examination is carried out at intervals which vary from one month to three months according to the province. At the same time a sample is taken from each suspected quarter for laboratory examination, and in many schemes also a mixed specimen from each group of 5-10 apparently healthy cows. The detection of streptococci in a group sample is followed by further tests of smaller groups of or individual animals.

Occasionally, complete reliance is put in these measures, but usually a bacteriological examination of the milk of every cow is made at fixed intervals of three to six months and, for " *Kindermilch* " in some provinces, monthly.

Mixed samples from the four quarters are usually taken, and fore-milk is generally preferred.

The method of dealing with animals infected with mastitis streptococci varies. It the animal belongs to a herd used for the production of any of the special grades of milk, she must be removed either permanently or until she ceases to excrete streptococci. Although it is agreed that a cow which has shown clinical mastitis is apt to do so again during subsequent lactations, there exists some evidence in support of the view that mastitis streptococci may entirely disappear during a prolonged dry period.

In most herds under control, whether used for the purpose just described or not, it is advised that animals severely affected in two or more quarters be removed, dried off and, unless pregnant, slaughtered or fattened. Animals affected in one quarter should be dried off and re-tested again at the next lactation, whilst those showing typical mastitis streptococci but no naked eye alteration, should be segregated from the clean animals. Such separation should be effected as completely as possible and precautions, such as handwashing and the milking of affected animals last, should always be enforced.

A survey of the results obtained leads to the view that herds can be maintained to a large extent free of obvious alterations of the milk. The degree of confidence with which such an opinion can be expressed seems to follow rather closely the frequency and thoroughness of the examination; nevertheless, some workers—who have been able to enforce thorough segregation based on fairly complete methods of examination—have not met with entirely satisfactory results.

In most herds regarded as free from mastitis infection cases frequently occur in which an animal previously passed as clean has become clinically affected with mastitis. This is probably due to the method of examination, which is mainly clinical and microscopic, but in some cases includes the so-called bio-chemical tests for katalase, chloride content, and reaction. In all clean herds, what-

ever the method of separation, the incidence of mastitis is very much lower than that of infected herds and the number of animals found to be infected at subsequent tests of the same kind is always small.

The milk is always centrifuged and generally the amount of deposit is not accurately measured, but nothing less than approximately 1 per cent. sediment is regarded as sufficient evidence on which to condemn an animal. By a few workers half that amount is considered sufficient to warrant a further examination, or the criteria originally laid down by Trommsdorf may be accepted.

In any case an excessive deposit will probably be reflected in the microscopic picture and on this reliance is placed in most laboratories. The examination of the smear of deposit, appropriately stained, is directed towards finding typical mastitis streptococci associated with an excess of lymphocytes, polynuclear leucocytes or fibrin. If an excess of these only is found, or streptococci alone are present, another sample is obtained a few days later or a culture is made, even in laboratories which otherwise restrict their scrutiny to non-cultural methods.

The possibility of distinguishing the mastitis streptococcus from others is thus to our German colleagues, as to all workers on milk problems, a question of paramount interest.

The majority of German workers regard the mastitis streptococcus as microscopically of the closely packed so-called "palisade" type, generally occurring in long or moderately long chains as distinct from the somewhat elongated *Streptococcus lactis*, which occurs usually in the form of diplococci or very short chains. Most workers realise, however, that the mastitis streptococcus may assume quite short forms.

For differential culture use is made of some or all of the following media, though workers disagree somewhat as to their relative value:—(*a*) Broth or lactose broth for growth characteristics; (*b*) Agar plates, for type of surface colony; (*c*) Litmus milk, for acid, clot or reduction; (*d*) Methylene blue milk for reduction; (*e*) The brom-cresol saccharose alkaline serum-agar plate for fermentation of saccharose; (*f*) Glucose broth for determination of limiting hydrogen ion concentration; and (*g*) Hippurate broth for splitting of the sod. hippurate into glycocoll and benzoic acid.

There is a definite tendency in Germany to regard one entity as the cause of mastitis and usually to attach to it the name *Streptococcus agalactiæ*.

It may be that the cause over all Germany is similar, and indeed the writer saw sufficient to be convinced that in some institutes the greater part of the strains isolated are alike so far as the particular methods used can identify them; but seeing at other institutes the strenuous attempts similarly to identify the streptococcus causal of the mastitis of their region, one could not help but think that the common causal organism was often different. The homogeneity of type, where such exists, is probably only apparent and due to the fewness of the tests employed. Nevertheless, it is realised that, for a given region, certain criteria may be sufficient to distinguish the streptococci causal of mastitis from others likely to occur in milk.

BIO-CHEMICAL TESTS. In many provinces an indication of udder disturbance is sought by the use of various non-bacteriological tests.

The Thybromol test depends on the colour produced by the addition of a standard proportion of the indicator and gives an index of the reaction of the milk, which must be fresh.

The Catalase test must be performed with fresh milk and depends on the splitting of oxygen from hydrogen peroxide in solution. In the laboratory the methods of Roeder, Lobeck and Huynen or modifications are used; one part of 1 per cent. hydrogen peroxide solution is mixed with three parts of milk and incubated at 37°C. for one hour in an apparatus in which the gas separated can be measured. The criteria vary, but less than 10 per cent. of gas is generally regarded as normal, over 15 per cent. as definitely abnormal. In the cowshed one part of 3 per cent. hydrogen peroxide is added to three parts of milk and allowed to stand about 15 minutes, under 25 per cent. of foam being considered normal and over 50 per cent. definitely abnormal.

The Chloride content is obtained by adding to the milk sample, which need not be quite fresh, a known amount of a standard solution containing silver nitrate, hydrochloric acid, and ferric ammonium sulphate, and titrating the excess against a standard amm. thiosulphate solution; the amount of chloride originally present can then be calculated or, in the form of apparatus commonly used, read directly from the burette. The normal figure is regarded as under 0·115 per cent. (by some under 0·112 per cent.), whereas 0·12 per cent. is generally regarded as definitely abnormal. In chronic mastitis it is often 0·15 per cent. or more.

Of distinctly less value is the taste test, which is, however, not infrequently used; an experienced worker may be able to detect as salty, milk with a content over 0·115 per cent.

Of the non-bacteriological methods the catalase test is generally preferred, but certain workers experienced in both this and the chloride content test regard the latter as more useful. In any case all these tests can only be regarded as mirrors of the state of the udder and when compared with cultural tests, using milk from the four quarters of an udder, it has been found that the reaction test fails in at least 60 per cent., the chloride content or deposit test in 40-50 per cent., and the catalase test in probably 25 per cent. With quarter samples, the examination of which in many laboratories is not considered practicable, the results are of course somewhat closer. The methods are also considered useful in indicating the so-called non-specific disturbances. They are of no value in testing the udder secretion of a newly-calved animal or one that is nearly dry.

THERAPEUTIC MEASURES. Although various chemical agents have been used subcutaneously or *via* the teat canal (with in some cases, it is said, good results), the evidence obtained from experiments, including a sufficient number of untreated cases or coupled with bacteriological and other laboratory examination, indicates that the agents tried are of little value.

Stripping at frequent intervals, in many cases two-hourly, night and day for long periods, up to 14 days, and sometimes coupled with massage in a downward direction, has been extensively tried and does appear to have been followed by good results. The practical difficulties of carrying out such measures are, of course, very great.

Mastitis due to *B. pyogenes* has recently been of low incidence; a few years ago, in Schleswig-Holstein and Mecklenburg and to a less degree elsewhere, it was a serious problem. A study of the disease reveals the same characteristics as are recognised in this country, and treatment is similarly ineffective.

It has been transmitted by injection *via* the teat canal, but attempted transmission by means of flies has not been successful. Various attempts to cap or otherwise seal the teat canal have entirely failed.

Mastitis due to staphylococci, coliform organisms and types other than those described is considered of little im ortance.

Bovine Abortion.

Bovine abortion is widespread over Germany, but no imperial or provincial regulations exist and, whilst certain owners maintain herds free of the disease, control is generally attempted by the use of vaccines, living cultures in the case of animals non-pregnant or even 1-3 months pregnant, and for those more advanced, dead bacilli. The latter have the advantage that they cannot produce the disease, but unfortunately there is little evidence that they have any marked effect on the resistance of an animal, whether infected previously or not.

Living vaccines are believed, in Germany as in other countries, to be efficacious in decreasing the chances of infection, whilst, should the latter occur, the likelihood of the infected animal producing a living calf is increased. They have however certain disadvantages, the greatest of which is that vaccinated animals, although themselves not aborting, may continue to harbour the organisms and distribute them in milk or, possibly, in uterine discharges.

Segregation of infected animals is practised to a limited extent. Diagnosis is based on agglutination and complement fixation tests.

A question which has become increasingly important during the last few years is that concerning the transmission of abortion infection to man. Instances of this frequently occur, particularly in North Germany, the human disease being evidenced by intermittent fever, a high blood content of agglutinating and other antibodies for *B. abortus* and in some cases by positive blood culture.

Should a demand for milk free from abortion bacilli be thus produced, more attention will of necessity be paid to the segregation of infected animals. By vaccination it is impossible to eradicate the disease and carriers, perhaps no less dangerous to human beings than naturally affected animals, may remain.

Tuberculosis.

Tuberculosis is considered to be the gravest of the three problems of cattle breeding in Germany. Regulations somewhat similar to our own recently enacted ones have been in existence over the whole country since 1912; they suffer, however, from the weakness that only animals with tuberculous mastitis need be killed at once. The milk of all other open cases must be sterilised before use, but the animals themselves are merely marked and kept under observation, until such time as they may be sent to the abattoir.

More success seems to have attended the various voluntary schemes of control. In such schemes, which have state and provincial support, the owner must submit his whole herd to periodic examination, following which all affected animals are automatically removed and the owner indemnified.

The initial examination is clinical and is followed by examination of specimens of lung mucus, milk, fæces or other material as may be considered necessary, or, it may be, by a complete test of all cows. Examination is first microscopic and negative results are then confirmed by guinea-pig inoculation. The tests are repeated at intervals of 3, 6 or 12 months, according to the state of the herd. In each herd, even though believed clean, one complete test is carried out each year, whilst any suspect animal is tested as occasion arises. Three times a year, group milk samples are examined by guinea-pig inoculation. Calves are segregated almost immediately after birth and fed on clean or pasteurised milk. Tuberculin tests are used only on young animals and then only at the request of the farmer.

There is evidence that in herds to which this scheme has been carefully applied, for periods of 2-5 years, tuberculosis has been very considerably reduced and in many cases apparently eradicated.

B.C.G. Vaccination. Accepting the results of their own workers and those of most other lands concerning the extremely low pathogenicity of the B.C.G. vaccine, experiments have been carried through which would argue a relative protection of animals vaccinated as compared with controls, when submitted to test inoculations of virulent tubercle bacilli.

Since the beginning of the year the protective power is being tested under more natural conditions. For this purpose a herd of 300 Friesian cattle is being used; of these 70-75 per cent. are tuberculin reactors and 10-15 per cent. open cases.

All calves born are allowed to receive colostrum for three days; each is then isolated and fed on milk free from tubercle bacilli. During the first week two-thirds are vaccinated, subcutaneously at the side of the neck. All are kept isolated for one month, then allowed to mix and as far as possible kept under natural conditions.

The results of these experiments will be eagerly awaited for the light, confirmatory or otherwise, that they must throw on this possible alleviator of one of the major problems of all western countries.

In Germany it has long been realised that efficient control of animal disease is to a large extent dependent on a satisfactory teaching, administrative and research service and this realisation is reflected in the ample provision made for equipment and maintenance. It serves to emphasise the indifferent conditions under which the profession in this country has not only continued the good work of its pioneers, but extended, in so many directions, its usefulness and its functions.

In conclusion, I want to express my thanks for the grant which made this tour possible, and my appreciation of the courtesy with which the various workers whom I met in Germany placed time and information at my disposal. Their kindness added much to the pleasure of a journey which was both instructive and stimulating and of assistance to the study of the problems of disease control in this country.

So-called Post-parturient Dyspepsia of Bovines and its Specific Treatment.*

By Oscar Stinson, M.R.C.V.S.

It was with the greatest pleasure that I received, from your worthy Secretary, the invitation to come to read a paper before you this afternoon. It was before your Division that I read my first paper on veterinary science, and I have never forgotten the courtesy with which you received me. Your candid criticism I enjoyed and admired. I hope that your confidence in me is not misplaced and that, by reading this paper this afternoon, I may be the means of helping the members of this Division and the profession as a whole. I have purposely made the paper very short, knowing that many of you may wish to speak; your remarks I am sure will be invaluable. May I say how delighted I am to know that you have succeeded in getting such an authority as Mr. Hudson to open the discussion.

I wish to say that I am very greatly indebted to Professor Russell Greig, who has assisted me in every way possible. Indeed, in justice to himself he should have been here to-day. In saying this it must be understood that I am wholly responsible for everything embodied in the paper, and do not commit anyone else.

To Dr. Dryerre I owe the examinations for the sugar estimations, and wish to thank him also for putting hours apart specially to receive and examine the bloods, probably at great inconvenience to himself.

To Dr. Hare I offer my thanks for corresponding with me some two or three years ago on the subject, and I cannot commence a paper on this subject without mentioning the name of Mr. Hugh Begg, Sen., as it was he who, by his writings during the last two or three decades on the disease, gave us something concrete to think about.

To Mr. Hudson and others, a similar expression of thanks is due.

It is by the process of elimination that we frequently come to definite conclusions, and thanks are always due to those who have the courage of their convictions.

Some time ago, Mr. Hudson read a paper, I believe before this Division, in which he associated the disease with "uterine fluids." The disease has, as a matter of fact, been looked upon in my district as being caused by some retention in the uterus, and on that account it is called "second cleansing." So strong is this belief that if I were to tell a farmer that in my opinion it had nothing to do with that, I am afraid it would be the last time that I should be asked to go to his farm. Although I have held for some years that the disease is associated with the emergency period of the cow, I respected Mr. Hudson's opinion and went into the matter fully, with the result that you would have seen some figures I collected with regard to the incidence of uterine fluid contents. I found, as you may remember, that many of them had no abnormal contents. Also, I might add that I have recently had a case in a cow a fortnight before calving. In addition, I have information in a private communication that another practitioner has had another such case. I have always recognised that it was a disease of the good milker, in the majority of cases, and it is on this foundation that I have based my investigations.

*Paper presented to the Lancashire Division, N.V.M.A., at Manchester on 10th October, 1929.

In the beginning, knowing of the association of milk fever and the heavy milker, I took many samples of bloods, which Professor Russell Greig kindly examined for the serum calcium content. It was found that although the calcium content was always rather low it could not be directly associated with the cause of the disease. Afterwards Dr. Dryerre kindly undertook to examine for sugar content samples drawn from other cases. In one case it was reported that sugar was only slightly less than normal: in a second that it was most decidedly a case of hypoglycæmia. Previous to this I reported some experiments in the *Record* in which I had given oil to some and sugar or treacle to others, that there was some improvement in the cows taking the sugar and that it was otherwise with those taking oil. These reports from Dr. Dryerre were very welcome on this account.

Realising that glucose was the treatment for a hypoglycæmic condition, I injected small doses subcutaneously with no beneficial results, which was unsatisfactory from the practical point of view. This result suggested that the condition being dealt with might not be an ordinary hypoglycæmia but that there was probably some need for readjustment, and that more than putting the blood sugar right was necessary. As previously stated, I had long associated the disease with the milk yield. I felt that the "machine" part of the cow must be sufficiently supplied before good results could be expected. As reported some time ago, I have found that there is no disease in which the milk yield is so much out of proportion to the severe constitutional symptoms. At this point Professor Russell Greig suggested giving big doses of glucose; this was wanted evidently for curative purposes. The result is that now I have worked out the doses so that a case can be cured with one dose given subcutaneously or by dosing by the mouth for a period of a week.

The following is a sample of the treatment, with results, when the glucose is supplied subcutaneously. Nine ounces of medicinal glucose are given in three pints of sterile warm water at about eight points, four on either side of the neck, high up.

	Date	*Acetone in Milk and urine.*	*Lbs. milk per day.*	
March	29		46½	
	30		36½	
	31		34	
April	1		36	
	2	-	30½	
First visit	3	+ + + + +	23½	Glucose.
	4	+ + + +	19½	
	5	+ + +	19	Clinically
	6	a.m. + p.m. O	27½	better.
	7	O	31	
	8	O	33½	
	9	O	34½	
	10		41	
	11		40½	
	12		46	
	13		39	
	14		43	
	15		41	
	16		45	
	17		43	
	18		46	

This has been chosen as an example of the result of the treatment, being the only case where the milk is "recorded." Other cases show most extraordinary results.

The treatment per os is 3 or 4 lbs. daily. Given as a drench 1½ to 2 lbs. night and morning in water.

That the administration of glucose cures the condition I have proved to my own satisfaction beyond doubt. The method of its action, in my opinion, is as follows. It relieves one of the two immediate conditions :—

1. A primary condition of hypoglycæmia, by supplying sugar in a utilisable form actually needed for the economy, or by providing a rest for the liver or some associated endocrine gland, the acetonæmic condition being secondary.

2. A primary condition of acetonæmia. It is well known that acetonæmia can be brought about in one of the following ways : firstly, as a secondary condition to hypoglycæmia resulting from the formation of " ketone " bodies, which inevitably gain entrance into the blood stream when sugar is being made from fats, etc. ; secondly, as a result of secondary " shock " which lowers the basal metabolism. The plasma bicarbonate is lowered, this being attributed to anoxæmia, which causes incomplete combustion of carbohydrates and possibly fats in the tissues, with the formation of acid products which pass into the blood.

The above two conditions can be brought about by similar prevailing conditions such as the following : strain or shock from milking, intensive feeding, inhabiting warm byres in the winter months, the effects of severe climatic conditions—which, by the way, cannot be dissociated from temperatures indoors, but perhaps are of more importance when cows are allowed to wander outside at watering time at leisure. This last point (the weather conditions) in my opinion is by far the most important with regard to the causation of the disease. It has been a very striking experience in coming from a practice in Kent, where I only diagnosed the condition twice in ten years, to Westmorland, where every other case at a certain time of the year is one of the disease. This fact puzzled me for quite a time, as I found no material differences generally in the methods of housing or feeding. After much enquiry I came to the conclusion that it has to do with the weather conditions in different localities. In the district where I am practising it appears to me to be due to a very great extent to the very severe east winds. That some localities, in the same district even, suffer from worse climatic conditions than others is well known. This may explain the reason why the incidence varies in the same county. I might mention here that when hypoglycæmia is artificially produced for experimental purposes, cold baths are employed successfully along with other means. Also, the " shock " from exposure to cold is a cause of acetonæmia. As the disease is mostly met with during the time the cows are indoors, its greatest incidence is after parturition and when they have been tied up for a considerable time, at a time when they are constitutionally at their lowest resistance. With me it is during the months of February, March, and April. I consider that a suitable name for the condition would be " Bovine Hypoglycæmic Ketosis."

May I, at this point, include a medley of a few practical points with regard to the disease :—

Acetone in the milk is always present in subjects suffering from the disease.

Rothera's test is an invaluable test for detecting acetone in the milk ; it detects the presence of acetone although the milk may have no appreciable odour peculiar to it.

In occasional cases of the disease the milk has an odour best described as an aggravated new milk odour.

Constipation is not by any means a constant symptom.

Sometimes a case is met with in the summer time, particularly when there is less grass than normal and it is particularly dry ; at these times a pregnant cow may be affected.

A bold dose of any aperient, even when the one chosen is treacle, may render the patient comatose.

A patient suffering from the disease should be put in a loose box and not tied up, until convalescence has commenced.

A cow being specially fed after serious handling may develop the disease.

A cow can suffer from a disease such as wooden tongue at the same time.

A pint and a half of linseed oil given as a purgative can, on occasions, cause the death of a suffering cow.

When treating it is best to put the patient in an airy box.

In all emergency cases when glucose is not at hand inflation of the udder is indicated. It would be well done along with the administration of glucose in serious cases.

Drenching in the treatment must be done very carefully.

As there is an interval of about two days after the administration of glucose before results are distinctly seen, bicarbonate of soda is indicated per os or per rectum as well as " inflation " in particularly serious cases.

In treatment of the acute nervous type of the disease " inflation " should be considered as important as " inflation " in milk fever. The administration of glucose should be looked upon as of secondary importance, but essential in these cases.

In cases of disease in cows having calved within the previous two months, and where other trouble is undiagnosed, apply the above test for the presence of acetone. In suspected cases of tuberculosis the test has even revealed that the subject is actually suffering from the disease under consideration.

The test should be used in examining urines and udder secretion of in-calf cows, particularly when within a month of calving. Heifers are subject to the disease as well as cows, either in-calf or more particularly at the usual time of occurrence of the disease, after calving. A cow may have it two successive years—a tendency, probably.

Although oil aggravates the condition and sometimes plays a part in causing the trouble when fed, a cow can get the disease without ever having touched anything of an oily nature.

Some buildings in certain susceptible districts are noted for cases of the disease. The building of a new hygienic byre is frequently the means of getting rid of the yearly cases.

A byre on one side of the yard may have cases year after year, when the byre on the opposite side of the yard has none. These particular byres may have two in suffering from the disease at the same time. On more than one occasion I have been asked if the trouble is infectious.

When under treatment put on to a carbohydrate diet.

When treating the disease do not make a sudden change in the diet of the patient or it may precipitate a comatose condition such as is seen, in rare cases, after giving an aperient. " Inflation " on occasions works wonders,

particularly when constipation is a symptom; but, generally speaking, it cannot be relied upon. Inflation frequently acts as an aperient or purgative in a cow. If a case were subjected to repeated inflation, as is the procedure in milk fever sometimes, only at longer intervals—say, every other day for about four times—I am of the opinion that the disease would frequently be cured.

The fact of ordering the administration of medicaments in treacle has at times resulted in the farmer modifying his rationing of his cows, with the result that cases afterwards have been few and far between. Although treacle has some slight curative effect on certain cases, and although it has been very useful in preventing the disease, generally speaking it is not a great deal of use in treating the disease. It requires a sugar in a utilisable form such as glucose.

Occasionally the temperature may reach 104°.

In bringing to your notice this new treatment I do not suggest that your obligation to a patient will be at an end when you have treated it as prescribed in this paper, but that you would be assisting by giving more glucose in selected cases.

I have not gone into symptomatology, as it is so well known to us all. The biochemical considerations would take up a great deal of time, and justice could not be done to these in a paper such as this. I have therefore not gone into them. At some future date I hope to make a detailed communication on the disease.

I think that if I stop here it will be an advantage. It will give Mr. Hudson a good opportunity for the opening of the discussion. I shall be pleased to answer any questions or to attempt to qualify anything I have stated, and I look forward to an interesting and profitable discussion.

Discussion.

Mr. R. Hudson: When venturing to open the discussion on Mr. Stinson's excellent paper, I had no idea of posing as an authority on the subject, as he chooses to call me. It was more with a view to extending a helping hand to the Lancashire Society and of having an opportunity to learn something from the essayist and the debate that I undertook my task. The essayist is fortunate in having such eminent co-workers as Dr. Dryerre and Professor Greig. It is a pleasure to see them alongside a country practitioner and augurs well for the future.

The essayist has confined his remarks almost solely to treatment, which I think, is a pity. He suggests that I might lead the debaters into the wilderness whilst he, bringing up the rear, will lead us safely to an oasis of sugar. The essayist assumes that the symtpoms are well known, but that does not appear to me to be so. I have met many general practitioners who have not recognised them or associated them with acetone smell. Mention is made of comatose conditions as though they were common, but that has not been my experience.

I think it would be well if, at this point, I gave you the symptoms.

We often see the animals about ten days to three weeks after calving and they have often been ill some days before then, so that one may place the early symptoms at about seven days after calving, and the latest at about seven to eight weeks.

The symptoms vary in intensity and variety, and the cases may be classed as mild, severe, and nervous, all having acetone-smelling breath. In mild cases one notices little change. There is the breath smell only, noticed on entering the byre and confirmed by examining the cow when she is to all appearances in good health. Other cases show loss of appetite, weakness, reduction in milk yield, subnormal or slight rise of temperature, increased pulse rate, constipation, and even in the mild cases a shrunken appearance. Many show great weakness, often rising with difficulty and rocking when walked. The breath, urine, and milk have the strong significant smell (acetone). Appetite and rumination may be entirely suspended or both may be feebly carried on. The pulse is fast—often 80, temperature 102-104.

Along with the foregoing symptoms one may see, if the animal is turned out, inco-ordination of movement, partial loss of use in the limbs (which may lead to falls), circus movements, partial and total blindness, fits, slavering and biting at the limbs, champing of the jaws, trismus.

It is not uncommon to find a smell of acetone in the breath and milk in typical milk fever cases. These cases respond to udder inflation, but I have not found the latter of any use in the condition which we will call—for the time being—acetonæmia.

Now that the disease has gained more prominence, we shall find that the presence of acetone in the breath and urine is by no means confined to the post-parturient state. I have met with it sometime before parturition, and once I met with it in a bullock. Neither is it confined to the cold season of the year, for I have recently had a case during the very hot weather. Acetone in the blood stream, in excess, is only a symptom and one might expect it to arise as the result of any upset to the liver, pancreas, and those glands which rule the complex function of metabolism. Does the essayist think it possible that it can ever be a primary condition?

The essayist would have us diagnose our cases by means of Rothera's Test because it will detect acetone in milk when we cannot smell it. Urine of cattle is said to contain it always, so why not milk? Would not the reported presence in cases where it could not be smelt be apt to lead to confusion?

There is no mention of what the amount of sugar present in the blood amounted to, and what inclined Dr. Dryerre to estimate it as too low and so regard it as a hypoglycæmic condition. It would be of interest to know what the sugar content was, for, judging by the estimate of various authors as quoted by Professor Russell Greig (*Veterinary Record*, Nov. 19th, 1927) 51·75 mg. per 100 cc., milkers—80 mg., dry cows, 60 mg., milk cows, 80—120 mg. per 100 cc., the sugar contents are very variable. The blood sugar standard set by Widmark is 60 mg. per 100 cc. for milkers.

While doubting the hypoglycæmic theory, I might here quote, from Professor Russell Greig's paper, that udder inflation increased the glucose content of the blood from 80 to 97·77 mg. per 100 cc., with a lasting increase for eighteen hours. Thus, if repeated and the glucose in the blood continued to be replaced, inflation should be a good treatment. As I have said before, it has not proved good treatment with me, and I should like to have the opinions of others on it. Possibly the increase of lactose in the blood following inflation neutralises any good effects which might be set up by the increase of glucose.

The use of glucose as a remedy is not new, though the essayist has not mentioned any previous writing on its use. I do not know who first suggested it, but in the *Veterinary Journal*, June, 1926, Mr. Rutherford Wallace mentions it in the treatment of the disease. He gives 10 ounces of a 10% solution intravenously and remarks that temporary benefit may result, which does not sound very hopeful.

Why does the essayist inject so large a quantity (9 ozs.) in such a large quantity of water (3 pints)? I should like to know how long it takes to absorb, also how it is injected. Its absorption must take a long time and one would think, therefore, it would be less useful than the intravenous way. There would be danger of shock perhaps, but repeated intravenous injections of smaller quantities appeal to me rather than the subcutaneous injection of three pints.

With regard to predisposing causes, the essayist claims much for east winds and exposure generally. I cannot associate my cases with them but rather to close housing, want of exercise, and I might say, over-feeding. Often water is carried to them. I am inclined to think that the disease is more common in the North, but this may be on account of the animals being housed more.

I agree that a patient should be placed in a loose box, but only when it cannot be outside. It is generally agreed that fresh air is the greatest aid to treatment.

Soda bicarbonate is suggested in the absence of glucose. Does the essayist think it can be absorbed into the blood as soda bicarb. What dose would he give ?

"In the treatment of acute nervous types, inflation should be considerd as important as inflation in milk fever." I use the words of the essayist. Now what nervous type is referred to ? If the epileptic, may not inflation be contraindicated and increase the symptoms, and why not give chloral hydrate ?

The essayist would "apply Rothera's Test to udder secretions and urines of in-calf cows within one month of calving." What for ? What would he do if they were positive ? Does the essayist mean that heifers are as susceptible to the disease as cows, or that they are more prone to it before calving ?

What influence can a byre have on the production of the disease, and what was the difference between the two sides of the yard ?

Put on a carbohydrate diet, what diet would the essayist suggest ? Grass I find the best, but it is hardly a carbohydrate one. The richer carbohydrate ones they will rarely take. Diet is important.

"Do not make a sudden change of diet." The essayist hardly need have issued that warning.

"Inflation on occasions works wonders." Well, it never has with my cases. Perhaps we shall hear what others have to say.

"Uses of treacle." I agree that I have not seen any benefit from it in treatment. Mixed with food and gruel it sometimes tempts them to take it.

It does not appear to me that the condition of sugar deficiency has been made out. One must bear in mind that we are dealing with a rapidly wasting animal, and a comparison should be made of the blood-sugar content of cows suffering from such wasting diseases as Johne's disease, tuberculosis, pneumonia, etc., and see how their index compares. Could not the hypoglycæmia be secondary to the acetone condition ? In mild cases recovery might be as rapid as the case quoted, with ordinary treatment. Much depends on whether the cow is inclined to feed and move about. This cow took fifteen days to "come back," which is not particularly rapid.

"In bringing to your notice this new treatment I do not suggest that your obligation to a patient will be at an end, but that you would be assisting by giving more glucose in selected cases." I cannot understand this paragraph. If glucose is a specific for the disease, it should be given in all cases.

"During starvation the amount of glycogen in the liver falls and eventually disappears. The liver has now liberated to the blood the entire amount of sugar it is capable of yielding." (SMITH.) Is glucose a natural sugar in the bood during life, or has it to be altered by the liver before it is fit for use ? Would an excess produce glycosuria, as in diabetes, act as a diuretic and be rapidly excreted ?

Mr. K. D. DOWNHAM said that, although he had not had much experience with the condition under discussion, he had recently been working on a disease in ewes which was similar in many respects, and, since treating with glucose, he had had a smaller number of cases. To one ewe that was suffering he gave 125 cc. glucose subcutaneously and bicarb. of soda, and she recovered. In all the cases dealt with there were found three or four classes of the disease, which were found by biochemical analysis. A number of farmers gave treacle and kept the animals out-of-doors for a day or two, with good results. The farmers were mostly of opinion that the trouble was due to cold winds and sudden changes. With regard to *post-mortem* examination, in each case the urine was found to contain acetone. He merely mentioned the disease because he was interested in the similarity of the two conditions. Acetonæmia might only be secondary and glucose had been found to be beneficial in such cases, but he thought the condition was primarily associated with pregnancy and many cases had been found to respond to inflation.

Mr. P. T. LINDSAY agreed that the causes were complicated and the condition difficult to deal with, but he did not agree that climatic conditions were a cause. He had come across cases of acetonæmia in shippons where there was no exposure to cold. With regard to parturition, he had detected the smell of acetone in the urine and breath of cows a long way off calving, and he was of the opinion that acetonæmia was secondary to some condition which caused a disturbance in the digestive process. Parturition might be one such factor, as cases often occurred soon after calving. He cited a case which he attended twelve months previously when a cow lost flesh and "hung fire" for four or five weeks. He treated her with bicarb. of soda morning and evening, and let her have any food she would take. After three weeks she improved and in five weeks fully recovered. She milked well until a month ago and then again began to lose condition, becoming emaciated. He tested her for tuberculosis and, getting a positive reaction, had her slaughtered. On *post-mortem* examination the lungs were not infected, but the mediastinal glands showed slight lesions and there was infection of the mesenteric glands. Also, there were adhesions between the reticulum and the diaphragm, and between the diaphragm and the pericardium, and abscess formation due to a nail. It was the latter condition which he held was responsible for the trouble.

Was it possible that a condition such as this should be responsible for the disturbance in carbohydrate digestion? During the summer he had two similar cases, one a six-months' milker and the other a thirteen-months' milker. In both cases the acetone smell was most pronounced. In the first animal mentioned there was loss of condition for two weeks, and she developed a slight grunt and pleurisy. She was obviously a case of traumatic pericarditis. In the other case, the thirteen-months' milker, the condition was similar, but she was slaughtered early. Since then he had examined a number of carcases of dairy cows in the abattoirs, in 60% of which there was thickening of the diaphragm, and he thought they were all due to penetration of the reticulum. During the last six months he had treated other cases with elevation of the fore-quarters, as recommended by Imrie, with very good results. Some of the cases seemed to recover spontaneously in four or five days, and he did not think it was quite fair to give all the credit to glucose in cases where it was administered. Acetone smell was frequently noticed in true milk fever cases when inflation alone gave beneficial results.

Mr. E. H. CURBISHLEY expressed appreciation of Mr. Stinson's efforts and perseverance, which he thought would benefit the profession as a whole. The subject had been epitomised in a recent article published in *The Lancet* by Professor Marek, who headed the article as "The Significance of the Acid Base." Professor Marek began by first of all describing the hydrogen ion concentration and took his readers through acidosis, alkalosis, and ketosis, and recommended that urine should be tested for acidity regularly. Ketosis might arise through derangement of carbohydrate metabolism, and it seemed to him (Mr. Curbishley) that not all of these cases of derangement required alkaline medication such as soda bicarbonate, but some would respond better to acid medication. He agreed that among the many causes of the condition could be numbered over-exertion. Also, in housed cattle which were never let out, the constant respiration in a vitiated atmosphere might be a contributory factor. He did not agree with regard to exposure to cold winds, and thought the condition might be one of several.

Mr. G. MAYALL said he thought it was recognised that there normally was a small amount of acetone in the blood of cattle, and the test was to determine whether there was excess or not. At present the knowledge of the condition was very limited, and Mr. Hudson, in an article contributed to the *Veterinary Record* in 1926, headed "The Retention of the Uterine Fluids," described a condition similar to acetonæmia. The continental writers made a big distinc-

tion between acetonæmia and milk fever, and did not recommend inflation of the udder in the former condition. It appeared to him that glucose would best be administered intravenously, but many farmers were decidedly hostile to this form of treatment, and unless this injection was done by a capable practitioner disastrous results might follow. He would have liked Mr. Stinson to give more particulars regarding the injection and the type of syringe used.

Mr. T. WILSON was sorry the essayist did not describe the symptoms more fully. There did not seem to be any diagnostic symptom, but cases appeared to be rather like atypical cases of milk fever. Some of these cases recovered, whilst in others he had found, on *post-mortem* examination, a peculiar gelatinous condition of the loin muscles, for which he had difficulty in accounting. The condition was somewhat similar to that found in horses suffering from azoturia. Many cases occurred six to ten weeks after calving, and some were in the nature of an acute nervous condition. He wondered whether the condition was due to auto-intoxication, as he had seen comatose cows recover in an hour or two following treatment with formalin. Some responded better to acid treatment. Mr. Wilson concluded his remarks by asking if there was any connection between acetonæmia and the condition described in a recent article in the *Veterinary Record* as oxaluria.

Mr. W. KENDRICK said it appeared to him that they were dealing with several conditions, which he related. He saw the article referred to in the *Veterinary Record*, and before the war he had seen this condition of oxaluria in some horses, and they responded to acid-tonic treatment. With regard to acetonæmia, in his experience these typical cases seen after calving had responded to acid treatment, whereas he had had no success with soda bicarbonate. Was it not possible that hydrochloric acid, which was a normal constituent of gastric juice, could act as an intestinal antiseptic? He had seen a similar condition in ewes prior to lambing and had had good results from treatment, but usually the ewes brought dead lambs, probably through handling when drenching. M'Fadyean had described similar cases in which there was a fatty change in the liver on *post-mortem* examination, and he wondered if a similar condition had been found by anyone present.

Mr. J. HOLROYD agreed that the condition they were considering constituted a variety of affections, and had several designations. He agreed also with Mr. Curbishley that acid treatment was good for some, and alkaline treatment for others (for instance, soda bicarb.), but in either event he gave mag. sulph. He thought that the disease was regional, it being unheard of in some districts, and the same remark applied equally to individual farms. He had never seen a case in summer time. Mr. Hudson had given a paper to the Lancashire Division at Chester some time ago, in which he stated that he was of the opinion that the uterus had something to do with the condition but he, Mr. Holroyd, did not agree. With regard to treatment, he gave 9 ozs. of glucose dissolved in water, or 3 lbs. orally. Did Mr. Stinson use the same glucose for hypodermic injection as for oral administration? He had not recognised the nervous type as being associated with the condition under discussion. His experience was that the second calver was usually the animal affected, never the heifer, but that recurrences at subsequent calvings were common. He was not in agreement with Mr. Lindsay's theory that foreign bodies were a causal factor, otherwise one would expect cases to occur in summer. Further, the death rate in "slow fever," as the condition was called in his area, was practically *nil*, which was certainly not the case in traumatic pericarditis.

THE REPLY.

Mr. STINSON, in reply, expressed his thanks to Mr. Hudson for his instructive opening to the discussion and to his audience for the way in which his paper had been received. He would attempt to answer the questions raised and if he omitted to answer any question he would be glad of a reminder. Mr. Hudson had asked if he had found acetone in association with other conditions—he had done so, but he regarded them as entirely different from the condition under discussion and the treatment was not the same. He noted that Mr. Hudson had not had good results from udder inflation, but that was not his experience. Inflation of the udder never did any harm, especially if glucose was administered, and it was always well to do this, although it was important to see that the udder was inflated enough and early enough, or other conditions were likely to arise.

With regard to the application of the Rothera's test, it was to a practitioner's advantage to administer such test, and if one got a positive result it was something to work on and indicated trouble. The figures regarding sugar contents, presented by Mr. Hudson, were very interesting, but the subject was a very wide one and required careful investigation before anything conclusive could be reported. Mr. Hudson had asked what were the nervous types of the condition referred to in the paper and Mr. Stinson stated, as an example, that one of the cases dealt with had been given linseed oil by the owner before veterinary assistance was sought and the fats administered had brought about a comatose condition of the patient.

With regard to the causes of the condition, there were several—indigestion, exposure to east winds, vitiated atmosphere, lack of adequate housing, and diet, and the condition could be attributed to a combination of these causal factors. One thing was certain, and that was that exposure to cold air was a cause. It did not necessarily mean that because an animal was housed in a well-constructed byre it was not affected by the cold air. Mr. Stinson thought that no matter how good in construction the byre be, any change in outside temperature was bound to have an effect on that inside. With regard to carbohydrate diet, he usually gave bran, oats, and roots, and kept off proteins and fatty substances. Mr. Hudson had asked if he regarded glucose as specific treatment. Mr. Stinson replied in the affirmative. One, he said, could always give glucose with advantage, and if other practitioners had not had good results from it, it was probably due to incorrect doses being given.

Replying to Mr. Mayall, who asked what type of a syringe he used for injections, Mr. Stinson stated that it was an ordinary large syringe with a hypodermic needle, but one should take great precaution with regard to preparation of the sites and sterilisation of the instrument. Referring to acetone smell, he thought some odours were apt to be mistaken for acetone even though they might be entirely different. He cited an instance of a cork of a chloroform bottle which had become detached, and before he had discovered it he thought he detected an acetone smell. In reply to Mr. Mayall's enquiry regarding inoculation treatment, he thought that experiments might with advantage be conducted in that respect. He agreed with Mr. Holroyd that the condition was regional, it not being met with at all in some districts, and he also agreed with other speakers that exercise was an essential part of treatment, because the condition rarely occurred in cattle turned out twice daily.

ARMY VETERINARY SERVICE.

MOVEMENTS OF OFFICERS.

Major G. F. Watkins has returned from the Rhine, and is now doing duty in the Eastern Command. He is under orders to proceed abroad, for a full tour of duty, during the current trooping season.

Major R. H. Knowles sailed for Egypt on the 25th November, for a full tour of duty abroad.

Lieutenant I. D. Macrae sailed for India on the 10th December, for a full tour of duty abroad.

REGULAR ARMY.

Dec. 10th.—Capt. J. J. Kane is secd. for duty with the Ind. Continuous Serv. Cadre (Nov. 13th).

MILITIA.

Capt. W. Halstead relinquishes his commn. (Dec. 10th) and is granted the rank of Major.

A Sportsman's Journal on the R.V.C. Report.

"Observer," in the course of a recent series of his valuable notes in the "Horse and Hound," has some helpful and striking things to say concerning the condition of the Royal Veterinary College. "I was impressed," he writes, "by the deplorable fact that such a state of affairs should exist in a country where the love of animals is so marked as it is in Great Britain. . . . It is extraordinary that such a condition of things should exist in England, where animals are esteemed in a higher degree than almost anywhere else, and where numerous organisations exist for the furtherance of their welfare. It is astonishing that the people of this country should stand by and see this important fount of veterinary knowledge dry up without a wide manifestation of concern, such as might have been expected; although purse-strings are easily loosened for the benefit of objects abroad, by comparison much less worthy."

"Observer" quotes an extract from the Report of the Colonial Veterinary Services Organisation Committee, concluding with this reference to the teaching staff:—"They have made *great personal sacrifices*, and have *themselves provided much of the existing equipment*." "These italics are my own," he says, "and while the facts which the words convey are greatly to the credit of the staff, they in an even greater degree cry shame on a nation which is content to have its collective responsibilities in this direction shouldered, in whatever degree, by a few devoted citizens. It is a condition of affairs which should be put an end to as speedily as possible. The Committee has outlined sound proposals for placing the College upon a proper footing, for re-building, equipping, and maintaining it in an efficient and creditable fashion; and it is to be hoped that their recommendations will be given effect in the very near future."

In the same periodical Mr. L. Pallin, of Daventry, writes: "I am very glad to see your sympathetic notes about the Royal Veterinary College at last, and wish they could have come two years ago, when the appeal was made for the funds that were needed; as I feel certain that with "Horse and Hound's" far-reaching circulation, it can do more than anything else to help the good cause. Naturally, every right-thinking person in the Empire knows the vital necessity that proper veterinary services are to it, but how are they to know about the state of the old College if they are not told?"

Ionized Silver in the Treatment of Burns.

Dr. Shillito describes in the *British Medical Journal* his experience of the use of the ultra-violet argentum method of Dr. Kurt Huldschinsky, in the treatment of burns. Silver nitrate in a 1 to 5 per cent. solution is sprayed or painted on the area affected by the burn. An exposure of one to five minutes is then given with a mercury vapour or tungsten arc lamp at a distance of six to twenty inches, the varying limits being given to allow for the factors of the age of the patient, the size of the burn, efficiency of the lamp, etc. In the absence of an artificial source of ultra-violet rays an exposure to real sunlight, if it can be obtained, for half an hour produces much the same result. The silver nitrate is ionized by the light and the silver ion combines with the cell proteins—an effect which is practically instantaneous with artificial ultra-violet light; the whole area becomes black and dry, and a shiny coagulum is formed, fixing proteins resulting from cell destruction, which, if absorbed, give rise to the toxæmia often associated with burns, and at the same time the penetration of the rays to the deeper layers is prevented, thus counteracting any possibility of over-irradiation. Rapid healing is produced in second degree burns and the pain is very much decreased. No dressings are used and the bedclothes are not allowed to touch the treated area. Another application may be given in twenty-four to thirty-six hours if required.—*The British Journal of Biophysics.*

The Veterinary Record.

21st December, 1929.

THE TIMELIEST FESTIVAL.

In our northern land, at least, it would seem to be the happiest dispensation of Providence that the season of kindly cheeriness upon which we are about to enter should cleave at the darkest point the sombre period between colourful autumn and hopeful spring. In the absence of Christmas the human spirit, sensitive as it is to external influences, might well succumb to the modern vice of selfish introspection as summer's happy memories become effaced by the prospect of the dreary days ahead. It is here that Christmastide steps in with at least one universal gift, if we choose to accept—the awakening in each of a sense of sympathy, of an interest in the well-being of others, which leads the most self-centred of us, if we can do no more, to bestow upon our fellows the Compliments of the Season.

Scope for the exercise of our gift increases apace, for, judged by the multiplicity of appeals, a greater number of the needy than ever before are dependent upon the goodwill of those more fortunately placed to help tide them over to brighter days. Our own members need look no further than the institutions of their profession as channels for the outlet of their charity, and we need only remind them that the prevalent industrial depression has not left unscathed some members of our own profession, bringing an increased drain upon the resources of the Victoria Veterinary Benevolent Fund and the National Veterinary Benevolent and Mutual Defence Society. At Christmas, moreover, those charged with the administration of these organisations have the wholly-commendable desire to make that little extra provision for the comfort and enjoyment of their beneficiaries which the season suggests, and in this connection we would ask others to follow the generous example of certain members of the profession who, for years past, have placed at their disposal special donations for this purpose.

There is yet another professional institution which may most fittingly be made the subject of charitable attention at this time. The clamant needs of the Royal Veterinary College are common knowledge amongst *Record* readers, and we commend the Reconstruction Fund to them as a particularly urgent and inevitably fruitful field for the exercise of their benevolence. Signs are not wanting of a great, if

tardy, awakening of the public to the vital necessities of the grave situation in which the College is placed, and the interest recently shown by many of our contemporaries is deserving of our unstinted thanks. As an outstanding instance of this we would mention the frank and sympathetic references to the matter contained in a recent issue of the "Horse and Hound," which are quoted elsewhere in our columns and which will receive the gratitude and approbation of all animal lovers and of members of the veterinary profession in particular.

As is pointed out by our contemporary, anxious as one may be to assist any deserving cause, help will not be forthcoming, nor can it be expected, if the general public is not kept informed. Now that the Report of the Departmental Committee, reference to which has from time to time appeared in our pages, has been published, knowledge of the true condition of affairs has been disseminated, and it is now necessary to continue with propaganda—to hammer home, as it were, the dire straits in which this London landmark finds itself. Only thus can succour be secured. We recall the immense popular advertisement which was very rightly given recently to the fact that a certain London hospital was 'falling down.' Unfortunately, it is not necessary to make special effort so to instruct the citizens of the greatest city in the world with regard to the Royal Veterinary College, since this lamentable fact is self-evident, and the casual passer-by down Great College Street may rightly be excused if he crosses the road on reaching the environs of this institution lest he should be injured by falling masonry.

The appeal is not merely a veterinary one; it is essentially one of great national importance and must therefore be dealt with nationally. If the spirit of generosity characteristic of this season leads the public to respond more fully than hitherto to an appeal which aims ultimately at placing our much-neglected profession on a sound and proper basis, in keeping with its high traditions, and immediately at raising our buildings at least to a level with those to be found in almost every civilised country in the world, then indeed Christmas, 1929, will prove the timeliest festival.

(*Continued from next column*).

disease are said to have been germinating along with the catarrh; and the cost of another horse, who at the time of purchase was, to every appearance, in perfect health, is held to be recoverable after he is dead, because dissection of the body proves that disease must have existed prior to the coming of the animal into the possession of the purchaser.

(*To be continued.*)

From The Veterinarian, November, 1829.

Soundness in Horses.

By Mr. W. PERCIVALL.

(Read at the Veterinary Medical Society, October 21, 1829.)

(*Continued from page* 1098.)

To sum up, then, what I have advanced, it amounts to this:—

First, that actual disease constitutes unsoundness.

Secondly, that disease in its actual or recognisable forms, is better understood than defined.

Thirdly, that disease, in its relation to unsoundness, in disputable cases, is to be determined to be present or not, by the rule of impairment of function or capacity—irreconcilable with the natural efficiency.

The two first positions require no farther comment: it is the last one which falls upon me to defend it from the attacks to which I feel but too conscious it lies open. In applying this principle to the constitution, as a whole, I would say with our Chief Justice, that the test ought to be, "whether the animal can perform as before, and with the same degrees of facility and safety"; and in applying the same rule to the several component organs or parts of the system, I would say, that their deranged function or diminished capacity, putting disease out of the question, was only to be allowed to influence us to return the same answer when such local derangement or incapacity operated to the impairment or diminution of the constitutional powers, so that the animal could not, on that local account, "perform the same as before." Equally regardless, therefore, of change of structure and altered appearances, so long as they did not amount to actual or recognised disease, if a horse, nevertheless, could endure the same labour as he could have done without such alterations, and with the same degrees of facility, power, and stability, I should maintain that he was sound in constitution.

If the principle upon which I am at present proceeding be found only to be sound in itself, its adoption will save us a vast deal of uncertainty and perplexity in regard to cases which some look upon to be disease; others, not: being acknowledged to be of a dubious nature, they may be at once submitted to this test; and by it, and it alone, in their relation to the question of soundness, be decided. What are called "the effects of disease," therefore, need not trouble us longer than it will take us to determine on the duties or capacities of the parts in which they are seated, or their interference with the whole: so, it will be found, that what at one time constitutes unsoundness, and may therefore be viewed in the light of disease, at another time exists in perfect compatibility with the natural powers and capabilities of the machine, and therefore is not a cause of unsoundness.

I find, however, I cannot deal with the "seeds of disease" as I have dealt with its productions or effects. Most diseases arise gradually and imperceptibly: they are such in nature as to render it impossible for us to determine on the precise time of their origin; and very difficult for us even to speak with correctness of their duration, unless aided by personal report. A single and simple deviation from health may turn out to be the forerunner of some fatal malady; or, one disease, involving no danger in itself, may lead to the development of another, dangerous and irremediable. These lapses occurring in horses at the time they are passing from vendor to purchaser, and referred to us for arbitration, present us with difficulties of no ordinary concern and magnitude. One horse, who is sold with a simple catarrh upon him, is made returnable to the vendor in a state of pneumonia, because "the seeds" of that

(*Continued at foot of previous column*).

ABSTRACT.

[Experiences with Sacral and Lumbar Anæsthesia in the Ox. Prof. Dr. Goetze, Hannover. *Deutsche Tierärztliche Wochenschrift.* 1928. No. 50.].

Sacral Anæsthesia.

The writer first refers to the discovery of this therapeutic measure in human medicine in 1901. Two kinds are possible, the low and the high. In the former a small amount of anæsthetising fluid is injected into the upright vertebral canal. In the latter a larger amount is injected into the canal with the long axis of the body horizontal or with the head end lower.

Low anæsthesia is used in surgical interference with the perineal region. High anæsthesia may be used for nearly all operations on all parts caudal to the diaphragm.

In veterinary medicine these methods were tested on the horse in the Surgical Clinic at Berlin by Pape and Pitzschk in 1925, and on the ox by Benesch in 1926.

Götze, with an experience of over 200 cases, considers epidural anæsthesia to be an indispensable thereapeutic measure in cattle practice : especially is it useful in obstetric work.

Sacral anæsthesia consists of injection of an anæsthetising fluid into the vertebral canal, so that it acts on the caudal-most nerve roots. In this position the injection is made extradurally.

In the ox it is possible to obtain both low and high anæsthesia by varying the amount of fluid injected and by standing the animal up- or down-hill. For high sacral anæsthesia the site of injection is the depression between sacrum and first coccygeal vertebra ; and for the low between the first and second coccygeal vertebræ. The sites are easily found by digital palpation *plus* passive movement of the root of the tail.

Technique. Syringe and needle sterilised by boiling : ten cc. Record type and needle 6 cms. long with 1·8 mm. bore. Fluid best taken from glass ampoules already sterilised. Area shaved and disinfected. The needle is inserted in the mid-line forwards and downwards at an angle of about 50 degrees to the surface : it normally penetrates 2-4 cms. under moderate pressure when the point reaches the floor of the vertebral canal. If correctly situated, air enters the needle and the fluid should run in under light pressure on the plunger.

This anæsthesia can be carried out on either the standing or recumbent animal.

[Low Anæsthesia (see Figs. I and II). Tutocain or Novocain 0·5% is used. The dose is 10 ccs., but it may be repeated if necessary.]

Well nourished and fat animals required a larger dose : 20 ccs. being a usual initial one. The effects come on in 7-10 minutes. In addition to posterior anæsthesia, an excessive dose causes a variable degree of paraplegia—from unsteadiness behind to collapse of the hind quarters. In already recumbent animals a much larger dose may with advantage be given, *e.g.*, 30-40 ccs.

Low anæsthesia produces its effects on the tail, anus and rectum, vulva and vagina, and the perineum and a superficial area of the buttocks. In the male scrotum, sheath and penis are involved, although not completely. In cows the vagina becomes dilated ; straining is arrested or much lessened, and the entire genital passage is relaxed. The anæsthesia lasts for from 30-60 minutes.

High Anæsthesia. Of the 1·0% solution 80-100 ccs. for a small or thin animal, and 120-150 ccs. for a larger or fatter animal, are used. If standing, the patient falls down after 7-10 minutes. An extensive anæsthetised area is obtained, extending to a transverse plane through the last lumbar vertebræ, though not symmetrical, as the lower side of the body is more greatly affected.

In addition to the effects of low anæsthesia, there occurs here loss of sensibility of the entire hind limb, the udder in females, and the external genitalia in males. The writer has never observed any unfavourable after-effects following sacral anæsthesia.

Indications for use of Deep Sacral Anæsthesia.

Dystocias. Correction of malpresentations, and embryotomies, can be carried out without hindrance from straining. A dose of 10 ccs. should not be exceeded except where the first has had very little or no effect.

Torsio Uteri, to facilitate untwisting. It is better to wait till the effects of the injection pass off before delivering the fœtus.

Retained Membranes. In some cases it is beneficial.

Suturing a Ruptured Perineum.

Prolapsus Uteri. During reposition or amputation.

Sterility. Examination and treatment per rectum or vagina.

Ovariotomy per vagina. Peritoneum and ovary remain sensible to the pain of the instruments, however.

Indications for use of High Sacral Anæsthesia.

Examination of, and operations on, the penis, prepuce, etc. The penis is paralysed, hangs out of the sheath and is insensible.

Cæsarean Section. Preferably combined with infiltration anæsthesia over the site of the cutaneous wound.

Amputation of the Udder. Can be done quite painlessly.

Lumbar Anaesthesia.

In human medicine this was discovered by Bier in 1899, and is most used in gynæcological operations. It has been tried in all the common domestic animals, but has made no headway in practice. The author has tested it in 23 cases in his clinic. The site of injection, easily found by palpation even in well-nourished animals, is the soft depression between the last lumbar spinous process and the sacral spine. The cannula used is 14 cms. long and 1·7 mm. wide, provided with a mandrin, which latter is put inside the cannula during insertion and final extraction. (See Figs. III and IV.) The direction of insertion is exactly perpendicular. The skin offers the greatest resistance and also, alone, suffers pain. As the spinal cord here is only 5-6 mm. thick, and the canal has a vertical diameter of 2·4-2·9 cms., danger of injury is small : if correctly placed, the fluid runs in readily. Götze has used Tutocain 3%, 20-30 ccs. The animal falls to the ground 5-15 mins. after injection and the anæsthesia lasts a good hour. Body parts affected are the same as in high sacral anæsthesia except that all the parts posterior to the last to third last rib are affected.

In general, the effects of lumbar anæsthesia were much more varied than in sacral anæsthesia, and the author declares that the former must take second place to the latter in veterinary practice : in human medicine the converse is the case.

Indications for use of Lumbar Anæsthesia.

These are practically the same as those for high sacral anæsthesia, whilst the latter method is usually preferable.

J. T. E.

FIG. I.—METHOD OF MAKING A SACRAL ANÆSTHESIA INJECTION.

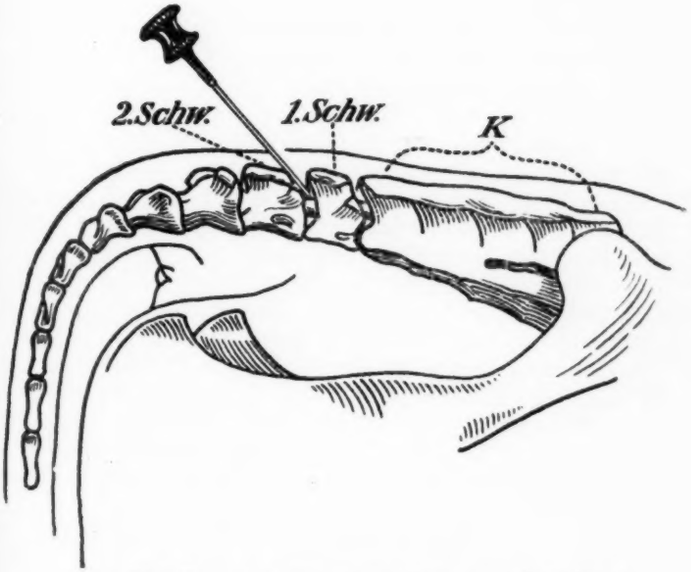

FIG. II.—DIAGRAM TO ILLUSTRATE SITE OF INJECTION FOR LOW SACRAL ANÆSTHESIA.

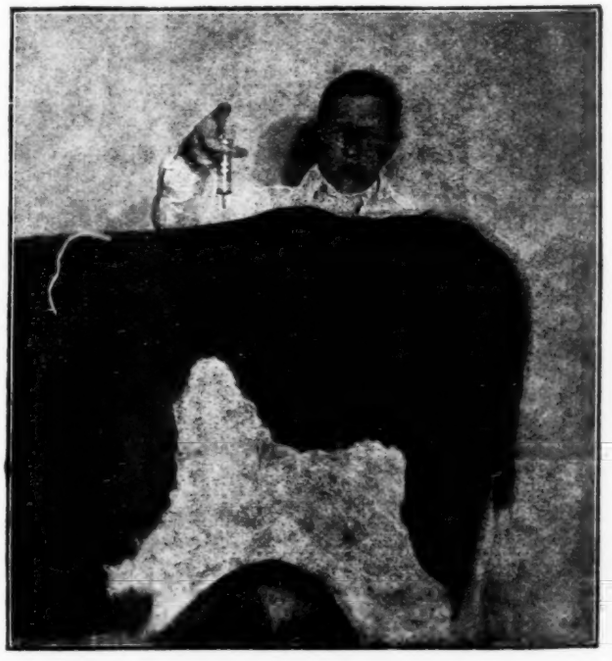

FIG. III.—METHOD OF MAKING A LUMBAR ANÆSTHESIA INJECTION.

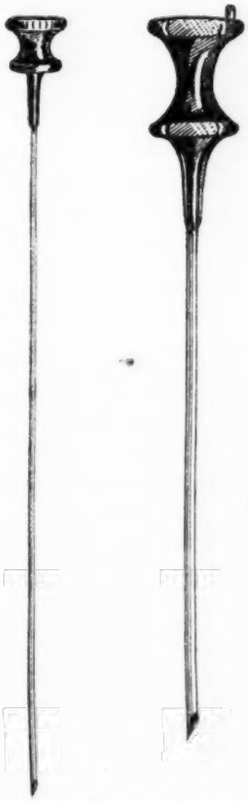

FIG. IV.—CANNULA AND MANDRIN USED FOR LUMBAR ANÆSTHESIA.

CLINICAL REPORT.

Ergot in Rye-grass.

By R. H. Heywood, B.V.Sc., Veterinary Representative in London of the Commonwealth of Australia.

During the discussion of the paper on the Adulteration of Foodstuffs which I had the pleasure of hearing at the Congress of the National Veterinary Medical Association at Newcastle, it occurred to me that an account of an experience with ergot in rye-grass might be of interest. The matter seemed hardly relevant to the subject under discussion, but that the presence of ergot in foodstuffs or forage can have disastrous consequences is possible.

During the war, when the Veterinary Research Institute, like most other public bodies, was very short-handed, I was assisting in the preparation of anti-meningococcic serum for army purposes, an occupation which had given me some slight knowledge of cerebro-spinal meningitis. The Victorian Department of Agriculture was as short-handed as the Veterinary Research Institute, to which it had referred a number of obscure diseases for investigation. The season had been a very wet one, resulting in the presence of a great number of smuts, rusts and other fungus diseases, and these causes were suspected of being responsible for a number of mysterious outbreaks of fatal diseases in stock.

It fell to my rather unhappy lot to investigate such an outbreak wherein a farmer had lost all his calves, and when a valuable draught mare became affected, had sought the assistance of the Department of Agriculture. On the way to the farm from the railway, the owner, who was an uneducated, but by no means unintelligent, farmer, explained that he was firmly convinced that his whole farm was affected with meningitis, and from his description of the symptoms exhibited by both cows and calves, a layman would have had some reason for his conviction. The cows had survived, but narrowly, and appeared not at all happy at their escape. They were just cows, which is the best and worst that could be said of them. Amongst other consequences they had absolutely ceased to lactate, they were lame and had necrotic areas round the feet and extremities.

In his treatment of the calves the farmer had adopted heroic measures, one of which was an endeavour to bleed them—an effort which had proved singularly unsuccessful although he had clipped quite large pieces from the ears and tails.

After excluding the possibility of mineral and other similar poisons, not excepting lead paint, and prompted perhaps, by the providence which is said to guide beginners, I concluded that the animals had suffered from ergot poisoning.

When we reached the farm it had become dark and I was taken to inspect the mare, which seemed about to pass away. She was breathing stertorously, her temperature was subnormal, and the extremities, which were stone cold, were quite insensitive to pain. I took my courage in my hands and gave her a huge dose of chloral hydrate followed by an equally generous injection of amyl-nitrite, with the result that within half an hour she was up and cropping hungrily at the grass. Next morning she was apparently quite normal and in good health, and I was rash enough to predict that if she were kept away from the source from which she had obtained the poison she would recover, provided peritonitis did not supervene, in which case I predicted the symptoms and indicated the probable findings on *post-mortem* examination.

A tour of inspection was then made of the farm and, to the surprise of the farmer and the secret satisfaction of myself, the rye-grass in pastures was found to be badly affected with ergot.

There was to my mind an explanation of the fact that no cattle on the neighbouring property were known to be affected, though the ergot was just as prevalent, but the farmer was far from converted until the *post-mortem* which I performed on the mare some four days later, did much to shatter his theory, especially as I had forecasted the resulting perforation and necrosis of the intestine and acute peritonitis, with considerable accuracy.

At this stage, I made a fatal mistake. Some ducks were wandering about, and before the carcase could be disposed of, gained access to the offal, off which they made quite a large meal, and I thoughtlessly and foolishly remarked that if the mare had had meningitis the time had arrived to say farewell to the ducks. Twenty minutes later, when we passed, I noticed that five of the ducks were dead and the survivors were exhibiting symptoms which I should say were the most alarming ever seen in poultry. I didn't venture to forecast what was going on in the insides of those ducks, but it seemed plenty. I never heard either, as I left on active service almost immediately; but the foreign substance in the rye-grass was proved to be ergot.

World Comparison of Cattle, Sheep and Pig Populations.

The following statement, published by *The Farmer and Stockbreeder*, shows the countries holding the largest numbers of cattle, sheep and pigs in the world. The returns are for the latest year for which sufficient figures were available for purposes of comparison. British India leads for cattle, Russia for sheep, and U.S.A. for pigs.

Cattle.—British India, 146,580,718 head; Russia, 67,835,000; United States, 55,681,000; Argentina, 37,064,850; Brazil, 34,271,324; Germany, 17,982,864; France, 14,940,960; Great Britain and Ireland, 12,230,042; Australia, 11,880,077; the Union of South Africa, 10,412,466; Canada, 9,172,238 head.

Sheep.—Russia, 120,237,000 head; Australia, 98,864,805; United States of America, 44,554,000; South Africa, 40,109,826; Argentina, 36,208,981; British India, 35,048,872; Great Britain and Ireland, 28,328,409; New Zealand, 25,649,016; and Uruguay, 22,500,000.

Pigs.—U.S.A., 60,420,000; Germany, 22,880,318; Russia, 20,022,000; Brazil, 16,168,549; the Philippines, 10,567,900; Poland, 6,333,456; France, 6,019,450; Spain, 5,267,328; Canada, 4,694,789.

Professor White, of the University College of North Wales, speaking at a meeting of agriculturists at Shrewsbury, said that such an improvement had been effected in the quality of meat imported into this country that it was of increasing importance that more and more attention should be given by the British breeders to the improvement of live stock.

Control of Bovine Tuberculosis in Canada.

VETERINARY DIRECTOR-GENERAL'S REPORT.

In his report as Veterinary Director-General, Department of Agriculture, Canada (for the year ending March 31st, 1929), Mr. George Hilton says :—

The continued progress in the control of bovine tuberculosis, and the persistent increasing demand of live-stock owners for this work indicates that the policies which have for some time been adopted are sound, practical and beneficial. As our appropriation and staff is naturally limited it has not been possible to satisfy this demand, and as a result there are many herds awaiting action, particularly under the accredited herd and area plans.

As the number of herds coming under our supervision increases, involving as they do much attention, it becomes increasingly difficult to arrange for the prompt testing of new herds. This is more particularly applicable to herds coming under our single herd policies, located as they are in widely separated districts. Many of the owners of these herds are constantly selling and purchasing animals, and much time is spent in testing additions on premises where purchased, and in the conduct of the re-tests in isolation on the purchaser's premises. Many new herds have been tested under your various policies, in addition to general tests of all cattle in areas previously dealt with.

While it is our custom to continue to test all infected herds, at suitable intervals, in an area until clean tests are obtained, it is important that too long a period is not permitted to elapse before all herds in areas are submitted to general tests. There is always a danger of clean herds becoming infected when reactors from other herds in the district are being moved about for shipment for slaughter.

It is preferable to conduct general tests yearly, but this practice would materially limit the amount of new work which could be undertaken. We cannot, however, delay these tests in areas in which much infection is found, and we are consequently giving them special attention and permitting longer intervals to elapse between general tests in comparatively clean areas. The cleaning up of these areas of infection undoubtedly has a marked influence in the control of tuberculosis in Canada as a whole. Approximately 130,000 tuberculous cattle have been slaughtered since the inception of our tuberculosis control policies, and the premises on which they were found have been thorounghly cleansed and disinfected.

While it is of the utmost importance to increase this work to the greatest possible extent, it is just as important that we do not permit our eagerness to make progress interfere with efficient methods. The very nature of this infection demands constant vigilance, and we cannot hope to make permanent progress if the amount of new work undertaken prevents us from giving the required attention to the herds and areas already under our supervision. The reduction of the infection to practical limits in areas requires close persistent attention, and any relaxation in this connection is costly, as infected centres do not remain stationary but increase steadily, sometimes rapidly, and are frequently responsible for new centres of infection. It is consequently of paramount importance to give the closest possible attention at all times to herds and areas in which the infection has been controlled, or even eradicated.

Our experience has shown that the area plan is the most practical and economical and the quickest way to control this disease. It permits of organised systematic work, expedites the testing of the greatest possible number of cattle in a given period, and lessens the shipping cost of reactors, as they can be consigned for slaughter in car load lots. It also provides a clean area for clean herds and materially diminishes the possibility of contact with tuberculous animals. It permits the use of common pastures, does away with the necessity of erecting double fences, and overcomes the many inconveniences experienced by stock owners in their efforts to keep their cattle from coming in contact with infection. It further creates an active market for the cattle, especially dairy animals, as there is a great demand for area cattle. The value of these areas to our live stock interests will depend entirely upon their reputation for clean cattle, and it is consequently very necessary adequately to prevent the introduction of infection into these areas. The regulations governing the movement of cattle into these areas from outside sources were formulated with this object in view, and also to protect the cattle owners from further losses and the department's financial policy.

There are so many varied interests in an area that it is unfortunately not possible to apply satisfactory protective measures without inconveniencing some of those interests, and many requests have been received for a relaxation of the regulations. I would, however, point out that due consideration was given these interests before the regulations were passed, but we could not overlook the fact that the restrictions were required to prevent the possible introduction into areas of an infection of a chronic insidious contact disease. It was consequently imperative to endeavour to prevent the introduction of tuberculous cattle, and with this object in view all cattle, with the exception of those for immediate slaughter, and those for transit by rail through an area, must pass a tuberculin test before entry, conducted by a veterinary inspector or an accredited veterinarian.

Upon arrival at destination in an area these cattle must be isolated for a period of sixty days ; upon the expiration of this period they are retested and if healthy are then eligible to come in contact with area cattle. If reactors are found they are promptly slaughtered, compensation paid and the premises are thoroughly cleansed and disinfected. The holding of the cattle in isolation for sixty days causes inconvenience, especially to those interested in the sale of cattle located in outside districts for movement into an area for feeding purposes. Our experience in testing over a million cattle shows only too clearly that we cannot hope to maintain clean areas if we permit healthy cattle to come in contact with cattle which have not passed two clean tests within an interval of at least sixty days. It is not safe to depend upon one test in cattle coming from infected herds, or infected districts, and this is the reason for insisting upon isolation of cattle entering our areas for a sixty-day retest, as we know nothing about the health status of many of the herds and districts in which they originate. This sixty-day retest has been waived in cases where cattle are shipped into an area for finishing purposes before slaughter in the area, or to points outside of it. These shipments are, however, only permitted when consigned to approved feeding premises.

Approved premises are suitably isolated and possess satisfactory facilities for the safe storage or disposal of the manure. They are maintained under quarantine and no cattle can be removed from the premises except by licence issued by one of your officers, for movement to an approved abattoir in the area for slaughter, or for any purpose when consigned to points outside of the area. Untested cattle may be shipped into an area for immediate slaughter if consigned to an approved abattoir, where adequate facilities exist so to dispose of them, and where they cannot come in contact with area cattle. These abattoirs must also have satisfactory facilities to dispose safely of the manure, and they are maintained under quarantine as far as cattle are concerned. No live cattle are permitted to be removed from these premises. It is claimed that this restriction causes losses, as it necessitates the slaughter of unfinished animals, and while this is undoubtedly true, it is, I believe, quite justified. In this connection I would particularly draw your attention to the fact that the introduction of untested cattle into an area is a special concession considered advisable and justifiable in the interests of trade, provided they are immediately slaughtered under conditions which do not menace area cattle. As untested cattle are continually on these premises, they must be regarded as infected premises, and we cannot hope to prevent the spread of infection from these premises if we permit the movement of cattle from them. There could, in the circumstances, be no justification in applying an initial test to cattle so introduced on an infected quarantined premises, maintained as a special privilege in an area, and then permit their movement to other points in it. The introduction of untested cattle for any purpose into an area is contrary to the principle involved in the establishment of these areas, and cannot be considered as sound practice. As we are endeavouring to eradicate centres of infection in our areas, and although we must permit procedures in order to meet essentially unavoidable conditions, it is important that we do not further relax our protective measures to overcome situations resulting from faulty trade methods which are not in our general interests. The only other untested cattle permitted entry into an area are those consigned for transit through an area. In case it is necessary to unload these shipments in an area for feed and resting purposes they must be unloaded in yards specially designated for that purpose, where adequate isolation facilities exist. As there is also danger of introducing infection into an area through the use of by-products of butter and cheese factories, and skimming stations, these products must be sterilised before shipment when consigned to points in an area.

With the strict enforcement of the regulations and the co-operation of the live-stock owners no trouble should be experienced in reducing the infection in any area to at least one-half of 1%, and maintaining it at this low level. The initial tests are the costly ones, as 86% of the compensation cost is incurred at the first tests, and definite progress is made as soon as these tests are completed, the reactors slaughtered and the premises cleansed and disinfected.

Special attention is being paid to the thorough cleaning and disinfection of infected premises, as we realise that the removal of reactors is only one step toward eliminating infection. Owners are required to scrape and scrub their barns and stables, remove all manure from their yards to a point where cattle cannot come in contact with it, and to scrape their yards and cover them with unslaked lime. The buildings and contact matter are finally disinfected with an approved preparation at an effective strength. As compensation is not paid until this work has been accomplished to the satisfaction of your officers, owners, as a rule, give it prompt and careful attention.

Good progress is being made; 1,395,000 cattle, or approximately one-seventh of the total number of cattle in the Dominion, have been tuberculin-tested by your officers at least once, and many of them oftener. There are approximately 730,000 cattle in our areas, and the infection has been satisfactorily reduced.

Considerable variation has been found in the percentage of animals affected with tuberculosis in the different sections of the Dominion, the incidence of infection having ranged from ·59% to 19% at the initial general tests in our areas. No undue difficulty has, however, been experienced in reducing the infection to practical limits in any of our areas, and there is a strong tendency on the part of live-stock owners located in the proximity of our areas to petition for the extension of these areas to include their territory.

As our experience has shown conclusively that we can make permanent progress under our policies, it is of the utmost importance that this work is expedited to the greatest possible extent, in order that we may overcome the natural spread of this disease while it is practical to do so.

The problem of vaccination, and more especially the method of Calmette and Guĕrin, is receiving the careful attention of our Pathological Division, and the results so far obtained indicate only too clearly the necessity of exercising caution.

. . . . . .

The work of the Contagious Diseases Division is the subject of a special report by the Chief Veterinary Inspector (Mr. A. E. Cameron) who says :—

In general the health of live stock in the Dominion has been good and the freedom from extensive epizootics has enabled a large number of veterinary inspectors to be employed on tuberculosis control work.

Considerable progress has been made in tuberculosis control. The single herd policies, the Municipal Tuberculosis Order, Supervised Herd Plan, and Accredited Herd Plan have been continued and a large number of cattle have been tested under the Restricted Area Plan.

Accredited Herd Plan. Since February 1, 1928, it has been required that before an application to come under this plan is accepted the owner must have at least ten head of pure-bred cattle of one breed registered in his own name, six of which must be over six months of age including a herd sire of at least one year. The pure-bred animals must also constitute at least one-third of the entire herd. Before an accredited herd certificate will be issued the owner must be in possession of fifteen pure-bred registered cattle.

The number of fully accredited herds is now four thousand and eleven (4,011). The number of herds undergoing accreditation is two thousand and ninety-seven, while 126 herds are awaiting first test.

A considerable number of herds under this plan have been included in restricted areas and the owners have preferred the area plan to continuing as an individual herd.

A total of 216,642 tests have been made and 3,944 reactors were slaughtered at a compensation cost of $224,921·32.

Supervised Herd Plan. Under this plan eleven hundred and twenty-five herds have been dealt wit has follows:—

Prince Edward Island	——
Nova Scotia	——
New Brunswick	25
Quebec	228
Ontario	664
Manitoba	163
Saskatchewan	42
Alberta	2
British Columbia	1
	1,125

During the year 174 reactors were slaughtered, but no compensation is paid under this plan. Practically the same methods are followed as under the Accredited Herd Plan and the owner receives the proceeds of the sale of the carcase if it is passed for food. This plan admits owners of grade herds or those who cannot qualify for the Accredited Herd Plan establishing a clean herd.

Supervised herds which are in a restricted area are automatically included in the area test and are no longer dealt with as individual herds.

Municipal Tuberculosis Order. No additional municipalities have been accepted under this order for over five years. One municipality in Quebec has been included in a restricted area, so that only twenty-nine municipalities now receive service. There are in Ontario 7, Manitoba 10, Saskatchewan 9, and Alberta 3.

During the year 78,054 tests were made and 1,115 reactors were slaughtered at a compensation cost of $40,564.50.

Restricted Areas for the Eradication of Bovine Tuberculosis. The following new areas have been completed:—

The File Hills Indian Reserve in Saskatchewan was established as a restricted area and all cattle were tested with tuberculin within a week commencing September 15th, 1928. Three hundred and eleven cattle were tested and twenty-three reactors were removed, or 7·4 %, at a compensation cost of $424.

The counties of Missisquoi, Iberville and Brome in Quebec were commenced on February 7th, 1928, and completed July 28th, 1928. 67,413 cattle were tested with tuberculin and 13,322 reactors were slaughtered (19·8%) at a compensation cost of $444,658.24.

By counties the results are:—

	Cattle	Reactors	%	Compensation
Missisquoi	26,781	5,169	19·5	$168,647 91
Iberville	12,903	1,107	8·5	40,944 33
Brome	27,729	7,046	25·67	235,066 00

The following restricted area was gazetted on October 27th, 1928. The county of Shefford, county of St. Hyacinthe, that part of the county of Drummond west of the St. Francis river, that part of the county of Sherbrooke west of the St. Francis river, that part of the county of Stanstead west of lake Memphremagog and of the Magog river, that part of Yamaska south of the St. Francis river, and that part of the county of Richmond south of the St. Francis river.

On March 31st, 1928, the county of Rouville was gazetted a restricted area and on January 26th, 1929, the county of Bagot and that part of the county of Richelieu east of the Richelieu river were also gazetted. The area bounded by the St. Lawrence, the international boundary and the St. Francis river, Magog river and lake Memphremagog when completed will be entirely under supervision as a restricted area.

On October 25th, 1928, tuberculin testing was commenced in the counties of Shefford, Rouville, and the portions of the counties of Sherbrooke and Stanstead included within the area. Thirteen veterinary inspectors were employed and the number of cattle tested to the end of March, 1929, is indicated in the following:—

County	Cattle tested	Reactors	Percentage	Compensation
				$ cts.
Shefford	38,511	7,330	19·03	254,144 00
Rouville	15,109	2,958	19·57	100,080 66
Sherbrooke (portion) ...	4,124	812	19·68	26,678 00
Stanstead(portion)	1,389	451	32·47	15,268 00

The second general test of the Huntingdon Extension Area, including the counties of St. John, Napierville, Laprairier, Chambly, Vercheres and two parishes of Richelieu, was commenced on October 25th, 1928. The portion of Richelieu county west of the Richelieu river has been completed, 1,210 cattle having been tested without a reactor being found. The county of Vercheres has also been completed; 11,900 cattle were retested and 149 reactors were slaughtered, 1·25 %, at a compensation cost of $5,288. The testing of the cattle in the remaining counties is under way.

The third general test in the Huntingdon area, including the counties of Huntingdon, Beauharnois and Chateauguay, was commenced on February 21st, 1929, and is still in progress.

All cattle in Prince Edward county area in Ontario have been retested. The first test was commenced May, 1927, when 24,184 cattle had 2·1% of reactors. The second general test was commenced December 13th, 1928 and completed March 6th, 1929; 20,644 cattle were retested and 97 reacted, or 0·47%. These were slaughtered at a compensation cost of $3,899. In Prince Edward county a large number of cattle have been sold for export. There are now fewer cattle than when the initial test was made. Infection has been reduced from 2·1% at the first test to 0·47% at this retest.

At the first general test of the Fraser Valley Area in British Columbia, commenced in May, 1926, 46,174 cattle were tested, with 7·9% reactors. At the second general test of the Fraser Valley Area in March, 1927, 46,191 cattle had 1.1% reactors. The third general test was commenced October 31, 1928, and completed in March, 1929. This test shows the infection has been reduced to ·76%; 46,480 cattle were tested and 351 reactors slaughtered at a compensation cost of $14,637.51.

In the Nova Scotia Area, which includes the whole province excepting Cape Breton Island, the retesting of infected herds has been proceeded with; 31,618 cattle have been retested and 384 reactors have been slaughtered at a compensation cost of $13,347.98.

RESULTS OF INITIAL AREA TEST IN THE PROVINCE OF NOVA SCOTIA, SEPTEMBER 8TH, 1927, TO MARCH 31ST, 1929.

Counties	Initial Tests			
	Herds	Cattle tested	Re-actors	Com-pensation
				$ cts.
Annapolis ...	2,280	14,584	380	12,192 33
Antigonish ...	1,630	14,103	140	4,450 00
Colchester... ...	2,444	22,459	1,015	34,681 33
Cumberland ...	3,182	23,770	413	13,301 00
Digby	2,275	10,485	41	1,393 00
Guysboro	1,826	6,924	12	295 00
Halifax	2,939	10,725	329	10,967 67
Hants	2,304	16,587	699	25,349 26
Kings	2,766	17,532	459	16,546 19
Lunenburg ...	3,684	17,024	346	12,048 67
Pictou	3,015	21,513	261	9,266 40
Queens	974	3,650	60	1,861 60
Shelburne ...	1,334	3,415	21	668 33
Yarmouth... ...	2,049	8,325	187	6,001 80
	32,702	191,096	4,363	149,022, 58

The following new areas have been accepted, but the tuberculin test has not been commenced: District of Kenora in Ontario, gazetted September 8th, 1928. It is estimated this area has 1,000 cattle.

In Quebec the county of St. Hyacinthe and portions of the counties of Yamaska and Drummond west of the St. Francis river, gazetted October 27th, 1928, and the county of Bagot and that portion of the county of Richelieu east of the Richelieu river, gazetted January 26th, 1929.

The counties of Vaudreuil and Soulanges, the Island of Montreal, Isle Bizard, Isle Perriot, Isle St. Paul (Sisters Island), Isle Jesus, Isle St. Joseph, and Isle Visitation, estimated to have 33,000 cattle, gazetted March 30th, 1929.

In addition to those new areas, it will be necessary to conduct the retests of the cattle in the following areas during the ensuing year if our progress in the reduction of tuberculosis infection is to be maintained:—

Prince Edward Island—approximately 95,000 cattle.

Nova Scotia approximately 192,000 cattle.

In *Quebec* the counties of Missisquoi, Iberville and Brome with approximately 67,000 cattle.

The counties of Shefford, Rouville, Sherbrooke and Stanstead with approximately 59,000 cattle.

The counties of Huntingdon, Beauharnois and Chateauguay with approximately 50,000 cattle.

The counties of St. John, Laprairie, Napierville and Chambly with approximately 35,000 cattle.

In *Manitoba* the Carman area is due for retest after three years and has approximately 22,000 cattle.

In *Saskatchewan* the Last Mountain Area, with approximately 22,000 cattle, is also due for retest after three years.

In *British Columbia* the Fraser Valley Area, with approximately 49,000 cattle, should again be retested in order to reduce infection below a half of 1%.

This list of retests due in areas already under supervision includes nearly 600,000 cattle and is exclusive of a large amount of work involved in retesting infected herds at sixty-day intervals.

A large number of veterinary inspectors are employed, making inspections of premises from which milk is exported under the United States Import Milk Act, and if our restricted area work is to be successfully prosecuted the time is approaching, if it has not already arrived, when the employment of selected local veterinarians will become necessary.

INSPECTION OF STOCK CARS AND YARDS.

The cleansing and disinfection of all stock yards and cars is carried out under supervision to ensure comfort and sanitation.

Stock cars are cleansed and disinfected at thirty-one railway centres in the Dominion. Stock car inspectors are maintained at these points and all stock cars arriving at or passing through these points are cleaned and disinfected under supervision unless they show evidence of having been so treated. A card is affixed to these cars showing the date of release and the name of the inspector. Railway companies co-operate fully in this work.

During the past year 96,999 cars have been cleansed and disinfected under supervision.

THE CALMETTE-GUÈRIN B.C.G. VACCINE.

Mr. E. A. Watson (Chief Pathologist) contributes the following interesting observations relative to the Calmette-Guèrin B.C.G. vaccine.

Many papers have been published during the year, adding to the already voluminous literature on the question of B.C.G. prophylactic vaccination against human and bovine tuberculosis. The question has become decidedly controversial and a subject for debate among scientific investigators, statisticians, tuberculosis workers and health authorities in various countries in Europe and in America. As the results of the researches and studies undertaken become known, alternating claims and counterclaims, contradictory evidence and conclusions, and conflicting explanations and hypotheses follow in rapid succession. There is much disaccord and difference of opinion, but a more discerning and cautious attitude towards B.C.G. vaccination and the claims that have been made for it is quite apparent.

Our own researches on the virulence of bacillus Calmette-Guèrin for small laboratory animals and our experimental study of B.C.G. vaccination of cattle, starting in 1924 and continuing to present date, have given unfavourable results and evidence in disproof of the claims made in regard to the absolute harmlessness and the immunising value of the vaccine. As one of the first to question these claims, and to have our work severely criticised for having done so, it is gratifying to find that eminent investigators in Europe and in the United States are reporting more or less similar evidence and results and are supporting our conclusions.

New-born calves, vaccinated and reared in a tuberculous environment or in cohabitation with tuberculous animals, may show some resistance during the first year of life, but, as the animals grow older and advance towards sexual maturity, the percentage in which tuberculous processes

are developing increases, and annual re-vaccination, in many cases, has not prevented progressive disease. This has been our experience and the experience in several European countries in which extensive trials of B.C.G. vaccination have been carried over a period of two or three years or longer. The favourable results that have been reported are based almost entirely upon observations made on animals under one year of age. We have repeatedly urged the necessity of keeping animals on trial until they are fully mature and have produced offspring of their own, until they have reached the stage when under the stress and strain of production they are most susceptible to active tuberculosis, before judging the immunising value of B.C.G. or any other vaccine.

In October, 1928, the League of Nations Health Section convened a Committee of Experts to consider and report on the question of B.C.G. vaccination in man and in animals. This committee avoided conclusions but recommended further researches and a plan of experimentation with cattle extending over a period of six years, at the end of which some definite conclusions might be drawn with regard to the safety, value and immunising efficiency of the vaccine.

In Europe the average incidence of bovine tuberculosis is very high, in some countries as high as 50 to 75%, and the conditions and difficulties in regard to control and eradication in such countries do not apply in Canada, where searching investigations indicate less than a 5% incidence of infection, and where direct eradication methods are proving practicable and successful. B.C.G. vaccination of cattle may possibly serve to palliate conditions in Europe, and it is with that hope that its application there may be justified. For Canada, for the control of bovine tuberculosis, it offers nothing to warrant its use; it is, in fact, contra-indicated by the evidence so far produced, and is entirely incompatible with present methods of control and eradication as carried on with the approval and close co-operation of the great majority of live stock owners, dairymen and health authorities.

A further report of our research and experiments with B.C.G. has been published in the *Journal of the American Veterinary Medical Association*, Vol. LXXIII, N.S. 26, No. 7, November, 1928. (Watson, E. A., McIntosh, C. W., and Konst, H.).

Hops as Food for Cattle.

"Hops were put up for sale as cattle food at the Birmingham Fat Cattle Show, which opened at Bingley Hall, on December 7th, for £4 a ton. The market price is £240 a ton," says *The Daily Express* Birmingham correspondent.

"A salesman explained that the reason for this was that the Government had purchased from the hop-growers the surplus stocks left after supplying the brewers' needs. Hops are now being sold with the proviso that they must not be used for brewing.

"It was not known that cattle were fond of hops, so the hops were first sold as bedding for the animals. I understand, however, that a farmer who bedded one of his cows in the herb found the next morning that it had eaten its bed. So hops are now being sold as a sort of combined bed and breakfast."

DIVISIONAL REPORT.

Lancashire Division, N.V.M.A.*

Meeting at Manchester.

A general meeting of the Lancashire Division, N.V.M.A., was held at the Grand Hotel, Aytoun Street, Manchester, on Thursday, October 10th, 1929, at 3 p.m.

The Chair was occupied by the President, Major W. G. Burndred, and other members present were Messrs. P. T. Lindsay, K. D. Downham, J. Birtwistle, E. H. Curbishley, W. Kendrick, G. Mayall, J. Norbury, A. J. Caldwell, T. Wilson, H. Sumner, Jun., C. T. Trevors, H. T. Matthews, R. C. Locke, W. Walker, J. Holroyd, and J. Spruell. *Visitors.*—Messrs. O. Stinson, E. F. Peck, R. Hudson, H. S. Caldwell, H. Warren, and J. Cochrane-Dyet.

Apologies for unavoidable absence were received from Messrs. Warwicke Fowle, J. K. Shaw, H. L. Torrance, J. H. Carter, P. Manuel, A. W. Noel Pillers, G.H. Locke, H. T. Holroyd, Col. Brittlebank, and Professor S. H. Gaiger.

The minutes of the last meeting were taken as read, and were approved.

Correspondence.—(1) From the Secretary of the National Veterinary Medical Association, with a report of an interview between a deputation from the Royal Agricultural Society and the National Sheep Breeders' Association and the Minister of Agriculture in order to discuss what could be done to lessen and, if possible, stamp out sheep scab in Great Britain.

It was proposed by Mr. Mayall, seconded by Mr. Lindsay and unanimously resolved, that the matter be left to the Council to deal with.

(2) From the Secretary of the Scottish Branch of the National Veterinary Medical Association, with which was enclosed a report of a Scheme for the Eradication of Bovine Tuberculosis. On the proposition of Mr. Matthews, seconded by Mr. Wilson, it was unanimously resolved that this matter be dealt with in a similar manner.

Nominations for Membership.—Messrs. G. C. Marginson, M.R.C.V.S. (Whitestake, near Preston), and H. S. Caldwell, M.R.C.V.S., D.V.S.M. (Vict.) (Newcastle-under-Lyme), were nominated for membership of the Division.

Election of New Members.—Messrs. J. Cochrane-Dyet, M.R.C.V.S. (Hooton), J. C. Naylor, M.R.C.V.S. (Alderley Edge), and E. W. Prescott, M.R.C.V.S. (Manchester), having been duly nominated for membership at the previous meeting, were elected members of the Division.

The nomination of Mr. Allan Leslie, M.R.C.V.S., Manchester, was withdrawn owing to his having obtained an appointment abroad.

The President then called upon Mr. Oscar Stinson, M.R.C.V.S., to give his paper in "So-called Post-parturient Dyspepsia of Bovines and its Specific Treatment."

(Mr. Stinson's paper, and the report of the discussion which followed its presentation, are published earlier in this issue of the *Record*.—Ed.)

A cordial vote of thanks to Mr. Stinson, proposed by Mr. Curbishley, and seconded by Mr. Lindsay, was carried

(*Continued at foot of first column next page.*)

* Received on 12th November, 1929.

NOTES AND NEWS.

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events.

Dec. 23rd—Special Meeting of the Editorial Committee, N.V.M.A., at 10 Gray's Inn Square, London, W.C.1, at 4 p.m. Ordinary Meeting, 4-30 p.m.

London University Examiners.

The following have been appointed by the Senate of the University of London to act as Examiners in the Intermediate and Final Examinations in Veterinary Science for Internal and External Students in 1930 :—

Veterinary Anatomy. J. McCunn (R. Vet. Coll.), Chairman; and the External Staff Examiner.

Veterinary Physiology. W. L. Symes (St. Thos. R.M.S. and R. Vet. Coll.) (Chairman); and the External Staff Examiner.

Veterinary Hygiene. G. H. Wooldridge (R. Vet. Coll.) (Chairman); and the External Staff Examiner.

Veterinary Pathology. T. Hare (R. Vet. Coll.) (Chairman); and the External Staff Examiner.

Parliamentary Notes.

Professor Share Jones, of Liverpool, has been unanimously invited to stand again as the Liberal candidate for the Oswestry Division of Shropshire. "At the General Election," says *The Liverpool Echo*, "he almost doubled the Liberal vote, reduced the Conservative majority by over 3,000, and increased the Liberal majority over Labour by more than 3,000. In a straight fight the Liberals of the division feel confident that Professor Share Jones can win the seat."

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Licences for Certified Milk. Mr. Greenwood told General Clifton Brown, that there was insufficient justification for a reduction of the fees of licences for certified Grade A tuberculin-tested milk. He would consider the matter in consultation with the Chancellor of the Exchequer when opportunity occurred for the general revision of the Special Designations Order. He would also consult the Minister of Agriculture.

R.C.V.S. Obituary.

Crawford, James Houston, Fitzroy House, Newmarket. Graduated, Glasgow, 20th May, 1909. Died, 12th December, 1929. Age 42.

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Percival, Harry, Bridge Street, Macclesfield. Graduated, N. Edinburgh, 21st December, 1892. Died, 9th December, 1929. Age 64 years.

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Erratum. The *Veterinary Record* for November 16th contained the announcement of the death of Mr. F. P. Bennett, with the statement that he graduated in 1869, which statement should have read "graduated 29th April, 1884."

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Death of Mr. J. H. Crawford, M.R.C.V.S.

Mr. J. H. Crawford, Sir Victor Sassoon's private trainer at Newmarket, died in London last week of septic pneumonia. Mr. Crawford was in London on the Monday on his way to Ireland when he was suddenly taken ill and was at once taken to a nursing home.

"Crawford was born in Ayrshire about 42 years ago and qualified as a veterinary surgeon at Glasgow," writes the Racing Correspondent to *The Times*. "Soon after qualifying he went out to India, where his elder brother was Judge to the West India Turf Club. I do not think that Crawford ever practised much as a veterinary surgeon, but he soon became known in India as a very capable amateur rider and as a trainer. He came back to England some years ago and acted first as private trainer for Mr. Goculdas. The best horse that he had through his hands in those days was Parth, who was placed in Papyrus's Derby, and afterwards won the 'Jubilee.' During the last few years Crawford had acted as private trainer to Sir Victor Sassoon, for whom he trained Hot Night, who was second in the Derby and the St. Leger in 1927. Crawford was an able and hard-working trainer and a good judge of a horse. He was, further, a very pleasant man, and will be missed by many racing people."

(Continued from previous page.)

with acclamation, and the meeting concluded with the paying of a similar tribute to the President for his conduct of the proceedings. John Spruell, *Hon. Secretary.*

CORRESPONDENCE.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents

The Veterinary Surgeon in Fiction.

To the Editor of the Veterinary Record.

Sir,—Another appearance of the veterinary surgeon in fiction may be added to your collection (*vide* this Journal, 1927, vii., 893) in the novel "They Had to See Paris," by Homer Croy. For this information I am indebted to E. V. Lucas of *Punch* (4th December, 1929, page 636), but on learning at the bookstall that the adventures of Pike Peters would cost me 7s. 6d., visions of some colleague making me a Xmas present persuaded me to keep the money.

However, for my weekly contribution to *Punch* I learned that a veterinary surgeon is the hero of the film based on the novel, that the hero (Pike Peters) speaks through the nose of a renowned American actor (Will Rogers) and that the part had in it "such a blend of simplicity and shrewdness, fun and pathos," that E. V. L. could not help being interested.

Not only is Pike Peters the first veterinary surgeon to lead in filmland but he is the first to have the honour of being drawn by *Punch*. Apparently J. H. Dowd shared E. V. L.'s opinion of the hero's part since he presents three drawings of Pike Peters, or are they Will Rogers? I think they must be Will Rogers, as the hero's face shows the hypertrophy of the buccinator muscles typical of the habitual gum-chewer, and (according to E. V. L.) Will Rogers chews gum, whereas veterinary surgeons just chew the rag.

Well, the hero takes his family to Paris, his daughter's hand is sought by a Marquis de Brissac (drawing No. 3), he borrows his valet's dress trousers (picture No. 2) and then visits a cabaret where (picture No. 1) Claudine introduces him to things his wife was not supposed to know of. Probably the story is different, but I don't pretend to understand films, especially talkies.

It adds to our appreciation of the author to learn that the Marquis wants a dot of two million dollars before marrying Pike's daughter, evidently he believes Pike to be worth it; Pike has retired from practice and of course he's an American, so why not?! In any case it's fiction.

I am, Sir, yours etc., Tom Hare.

Department of Pathology,
Royal Veterinary College, London, N.W.1.
11*th December*, 1929.

The Editor acknowledges the receipt of the following :—Report of a meeting of the Derbyshire Division, N.V.M.A., from Capt. O. V. Gunning, Hon. Secretary.

Communications from Messrs. H. Fraser, (Tavistock), T. H. Jones (Llandilo), G. Mayall (Bolton), G. S. Muir (Wellington, Ontario), Capt. J. F. L. Taylor (Montgomery, Punjab), and G. H. Williams (Chippenham).